Analytical Investigation of concrete beams reinforced with embedded CFRP plates

ABSTRACT

A detailed model and a nonlinear finite element analysis for concrete beams reinforced with embedded carbon fibre reinforced polymer (CFRP) plates, used as an alternative to FRP-bars, in a micro-model framework have been presented in this study. Bond relations between the CFRP plates and concrete have been proposed and failure shear envelope of the concrete-plate interface for normal and shear stress (σ-τu) has been also presented. A nonlinear analysis has been conducted for loaded concrete beams reinforced with embedded CFRP plates till failure. Results of the finite element analysis show a good agreement with the experimental behaviour observed. The surface texture of the embedded CFRP plate has been found to affect the concrete–CFRP interface bond behaviour and the structural response of concrete beams reinforced with embedded CFRP plates.

Keyword: Bond; Finite element modelling; Nonlinear analysis; Embedded CFRP plates; Beams; Structural behaviour